REMARKS

Claims 1-2, 4-6, and 8-15 are pending, with claims 1, 12, and 13 being independent. In this Amendment, claims 1, 2, 5, 8, 9 and 11 have been amended, and claims 3 and 7 have been cancelled. Claims 12-15 have been newly added. Applicants submit that no new matter has been added by this Amendment.

Initially, Applicants' representative would like to thank the Examiner for the courtesies extended during the personal interview conducted on November 1, 2006. This Amendment is being presented in accordance with the suggestions and comments made during that interview, in an effort to place this application in condition for allowance.

Claim Rejection Under 35 U.S.C. § 112

Claims 1-11 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite due to the use of the term "good." Without conceding the propriety of this rejection, Applicants submit that it has been overcome by the claim amendments set forth above.

Claim Rejections under 35 U.S.C. § 103

Claims 1-11 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Bonsel et al. (U.S. 6,197,147 B1) and further in view of Sompalli et al. (U.S. 6,524,736). Applicants respectfully traverse this rejection.

The Claimed Invention

Applicants' presently-claimed invention relates to a process of manufacturing membrane-electrode assemblies, the process including the steps of ***forming an electrolyte membrane by a film casting method in which a solution of a proton conductive polymer in a first organic solvent is flow cast on a film-casting substrate to form a wet film***, and ***the electrolyte membrane film is obtained by reducing an amount of residual solvent in the wet film, wherein the electrolyte membrane contains residual solvent in an amount of 5 parts by weight or less based on 100 parts by weight of the proton conductive polymer***; and pressure bonding electrolyte membrane with electrode substrates to form a membrane-electrode assembly. A second solvent is applied to at least one of facing surfaces of the opposed electrode substrate and the electrolyte membrane prior to the pressure bonding. The second solvent is applied in an amount of from 0.001 mg/cm^2 to 10 mg/cm^2. (Claim 1.)

Applicants' presently-claimed invention also relates to a process of manufacturing membrane-electrode assemblies, the process including the steps of forming an electrolyte membrane by (a) ***producing a wet electrolyte membrane film by a film casting method in which a solution of a proton conductive polymer in a first organic solvent is flow cast on a film-casting substrate***, and (b) ***reducing an amount of residual solvent in the wet electrolyte membrane film to form the electrolyte membrane***; and then pressure bonding the electrolyte membrane with electrode substrates to form a membrane-electrode assembly. A second solvent is applied to at least one of facing surfaces of the opposed electrode substrate and the electrolyte membrane prior to the pressure bonding. (Claim 12.)

Applicants' presently-claimed invention further relates to a process of manufacturing membrane-electrode assemblies, the process including the steps of forming an electrolyte membrane by (a) ***producing a wet electrolyte membrane film by a film casting method in which a solution of a proton conductive polymer in a first organic solvent is flow cast on a film-casting substrate***, (b) ***reducing an amount of residual solvent in the wet electrolyte membrane film by soaking in water***, and (c) ***drying the soaked, wet electrolyte membrane film to form the electrolyte membrane***; and then pressure bonding said electrolyte membrane with electrode substrates to form a membrane-electrode assembly. A second solvent is applied to at least one of facing surfaces of the opposed electrode substrate and the electrolyte membrane prior to the pressure bonding. (Claim 13.)

Independent claim 1 has been amended to incorporate the subject matter of previously-pending claims 3 and 7.

New independent claim 12 combines the subject matter of the previously-pending versions of claims 1 and 7.

New independent claim 13 combines the subject matter of the previously-pending versions of claims 1, 7, and 8.

Support for new dependent claim 14 may be found in the specification at least at page 35, lines 11-13.

Support for new dependent claim 15 may be found in the specification at least at page 35, line 22, to page 36, line 4.

Bonsel et al. and Sompalli et al.
Do Not Disclose or Suggest
The Presently-Claimed Invention

Bonsel et al. discloses that "to improve the adhesion and to bond the components, the contacting material or at least one flat face of the membrane or both components can be incipiently dissolved, wetted or incipiently swollen by a solvent...and the components, *i.e.*, one or both flat faces of the ion-conductive membrane and at least one electron-conductive contacting material, can then be fitted together by pressing and bonded by lamination." ('147 patent, column 6, lines 35-42.) Bonsel et al. does not disclose the amount of residual solvent contained in the membrane, nor does it teach limiting the amount of solvent utilized in order to avoid swelling. Bonsel et al. also does not disclose that the ion-conductive membrane contains a limited amount of solvent in an amount of 5 parts by weight or less (claim 1), that the amount of solvent is reduced in a reducing step that is carried out before the electrolyte membrane is bonded to the electrodes (claims 1 and 12), or the step of soaking an electrolyte membrane in water to remove residual solvent, followed by a drying step (claim 13). Bonsel et al. only discloses that a step for removing the solvent is conducted on the *laminated* membrane and electrodes, not on the membrane alone.

Bonsel et al. also fails to disclose the effect of the amount of residual organic solvent in the membrane. The disclosure found in Bonsel et al. at column 6, lines 43-57, which was relied upon in the Office Action to reject claim 3, *does not* relate to the amount of residual solvent present in the electrolyte membrane, and instead merely refers to the solution used to coat components with a catalyst suspension.

Sompalli et al. discloses that when preparing an MEA, "it is important to have an electrode with a relatively homogenous porous structure and which has good structural integrity," which is achieved by using a process that "significantly reduces excessive 'mud-cracking' of the electrodes during the drying stage." ('736 patent, column 4, lines 51-57.) The process entails forming an electrode on a substrate by applying a catalyst slurry containing a solvent, which evaporates to form the electrode film. ('736 patent, column 6, lines 6-10.)

Sompalli et al. discloses that the electrode is then applied to the membrane using a "decal" transfer process involving hot pressing, and the substrate is removed from the electrode after the membrane and electrode have bonded. ('736 patent, column 7, lines 41-66.) No solvent is applied to the membrane or the electrode as a step in the transfer process. Sompalli et al. does not disclose that the electrolyte membrane contains a limited amount of solvent in an amount of 5 parts by weight or less (claim 1), that the amount of solvent is reduced in a reducing step that is carried out before the electrolyte membrane is bonded to the electrodes (claims 1 and 12), or the step of soaking an electrolyte membrane in water to remove residual solvent, followed by a drying step (claim 13).

Bonsel et al. and Sompalli et al. both fail to disclose any step for reducing the amount of residual solvent in the membrane before the electrodes and membrane are pressure-bonded. Applicants submit that one skilled in the art having the disclosures of Bonsel et al. and Sompalli et al. before him would not be motivated to modify their disclosures to arrive at the presently-claimed invention.

Even if combined, and Applicants do not concede that Bonsel et al. and Sompalli et al. may be properly combined, their disclosures still would not achieve improved bond strength between the membrane and electrodes in an MEA, or minimize warping of the MEAs that is caused by the difference between the shrinkage ratios of the membrane and the electrode due to solvent evaporation. These benefits are achieved by the novel methods of the presently-claimed invention.

In view of the above, Applicants respectfully submit that Bonsell et al. and Sompalli et al., alone or in combination, fail to disclose or suggest the all features of the pending claims. As such, Applicants respectfully request that the rejection of the claims as allegedly being unpatentable over the combination of Bonsell et al. and Sompalli et al. be withdrawn.

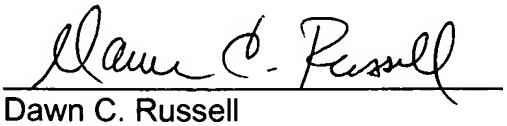
CONCLUSION

In view of the foregoing, reconsideration of the application, withdrawal of the outstanding rejections, allowance of claims 1-2, 4-6, and 8-15 and the prompt issuance of a Notice of Allowability are respectfully solicited.

Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below for a telephonic interview.

In the event this paper is not considered to be timely filed, Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, referencing docket number **026035-00010**.

Respectfully submitted,



Dawn C. Russell
Registration No. 44,751
Attorney for Applicants

Customer No. 004372
ARENT FOX PLLC
1050 Connecticut Avenue, N.W.,
Suite 400
Washington, D.C. 20036-5339
Tel: (202) 857-6000
Fax: (202) 638-4810

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